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river-beds, are correlated with the features of the plateau region to prove a great elevation which was permanent, while the drift and river deposits of the eastern region prove subsidence after Tertiary times.

BOTANY.¹

HOW SHALL BOTANY BE TAUGHT IN AGRICULTURAL COLLEGES?—Numerous factors enter into the problem, such as the size of the class, the age and preparation of the students, the season of the year, the length of the college term, the probability of subsequent study, the means of illustrations which can be commanded and many other similar considerations. All of those factors are so different and so variously combined, that a method, which on the whole might be the best in some particular case, might not be the best in any other case whatever.

Roughly classified, we may make out three different methods of teaching botany now in vogue; these may be termed the text-book method, the lecture method and the laboratory method.

It is fashionable now-a-days to decry the text-book method as altogether out of date, but in the hands of a competent teacher a good text-book is a most valuable aid. The lecture method is necessary in very large classes, but satisfactory results are rarely reached, even with the aid of copious means of illustration and a fairly good work of reference in the hands of the student. Nor is the laboratory method, pure and simple, altogether free from objection. Left largely to himself to find out important facts in regard to the specimens he is given to study, the student is sure to go astray and waste much time, a loss needless and inexcusable.

A judicious combination of the methods named would in all probability secure the best results in a majority of cases.

Let me suppose the class to number from thirty to forty, composed of young men of average attainments and ability, and that from three to five hours per week for a year is to be given to the subject. A desirable time for beginning the work of instruction is at the opening of the winter term, which in most colleges is soon after New Year's. For the first term the object is to gain a general view of plants and plant-life. The basis of the instruction should be lectures or talks, occupying a part of the hour, which the teacher can vary according to the needs of the class. An excellent accompanying text-book is Bessey's *Essentials of Botany*, from which pages may be occasionally assigned as a lesson to be carefully learned. Every subject taken up should be copiously illustrated with specimens which the student is to see and examine for himself. Occasional days are to be set aside for careful reviews of subjects already studied, and from time to time opportunity should be afforded for the examination of specimens under the microscope.

¹ Edited by Professor CHARLES E. BESSEY, Lincoln, Nebraska.

The special advantage of this method of instruction here suggested is two-fold: First, its flexibility; and second, the opportunity it affords for the effective use of the black-board. Figures and diagrams, drawn before the class, in which various phases of development can be shown, are far more valuable than any text-book figure, or previously prepared diagram. Nor should the advantage of giving out suitable topics or problems for the members of the class to examine and report upon, be overlooked. The skillful teacher will find no difficulty in assigning appropriate subjects, which will require independent observation and thought on the part of the student.

A term's work of this kind should give such a comprehensive view of plants as to make subsequent studies to the highest degree valuable and effective.

A second term may be devoted mainly to the higher plants. By this time the spring has so far advanced that an abundance of material for all sorts of works may be obtained. The basis of instruction may still be in the form of familiar lectures, but Gray's *Lessons* may be used and carefully studied. The instruction should be so planned that the work in class-room and out shall require a large amount of observation and study of plants themselves. Some time may be devoted to the identification of species, not that the name of the plant is the object sought, but that the work in question cannot help but increase the knowledge of the student in regard to the structure of plants, their differences and resemblances. A special study of particular subjects may be made, such as pollination, and the variations in structure and development relating thereto. Certain natural orders may be more carefully studied, and written descriptions and figures of some species or genera, made from the student's own observation, may be required. Some work also in the preparation of herbarium specimens, if thoroughly well done, is always profitable.

A third term may be given to questions relating to the physiology of plants. I do not know of any subject more important to an agricultural student than this. The instruction here must be largely in the form of lectures. Goodale's *Physiological Botany* is a most admirable work. It is perhaps too comprehensive to be used as a text-book in ordinary classes, but would be serviceable as a work of reference. Some well arranged laboratory work in the histology of plants is very desirable as a part of the instruction in the subject now under consideration. A special effort should be made on the part of the teacher to illustrate his instruction with as many experiments as possible. Many of these must be commenced long before they are needed for use in the class-room. One actual experiment which the class can see, is worth a large number of mere descriptions of experiments. Nor is it difficult to devise, in a fairly equipped laboratory, especially if a greenhouse is also available, a large number of experiments, which the student

can himself conduct, make his own observation and prepare a report of the results.

To my mind the scheme which I have here outlined rather than described, suggests at least a desirable method of teaching botany under the limitations named. It is capable of a great deal of modification as circumstances demand, and in the hands of a skillful teacher is likely to produce satisfactory results. In case the instructions end with the year, the student has acquired as large and useful a knowledge of plants as could reasonably be expected; and if he is to continue his studies further, he has an excellent foundation for thorough work in special subjects.

I think we are all agreed there is no royal road to learning; and I am sure that to no subject is this truth more applicable than to botany. And in conclusion I would suggest that the value of any method of instruction may be tested, first, by the extent and accuracy of observation which it calls forth on the part of the student, and second, and chiefly, by the amount of earnest and thorough work which it leads him to do.—*Professor A. N. Prentiss, in American Horticulturist.*

BOTANICAL NEWS.—A most important paper is now in course of publication in the Journal of the Linnean Society, beginning with the first number of Vol. XXIII. It is an "Enumeration of all the plants known from China proper, Formosa, Hainan, the Corea, the Luchu archipelago, and the island of Hong Kong, together with their distribution and synonymy," and will bear the title of "Index Floræ Sinensis." It is the joint work of Francis B. Forbes and William B. Hemsley. Already one hundred and sixty pages have appeared, covering the enumeration from Ranunculaceæ to Leguminosæ. A fine map of the region accompanies the work.—Thomas Morong's paper on the "Naiadaceæ in the Torrey Herbarium," published in the September number of the Torrey Bulletin, is a most useful one. It enumerates seventy-three species, of which *Potamogeton wrightii*, *Zannichellia indica* and *Zostera marina* L., var. (?) *latifolia* are described for the first time.—In the same journal Dr. Vasey publishes a synopsis of the genus *Paspalum* which will prove valuable to graminologists. Twenty-six species are described.—A late number of the Gardener's Chronicle (Sept. 4) contains an excellent wood-cut of the nut-pine of Colorado (*Pinus edulis*) from a drawing by Sir J. D. Hooker. It is accompanied by a short descriptive note.—The September Botanical Gazette is an "Association number," containing articles on the botany of the recent meeting of the American Association for the Advancement of Science, the Botanical Club of the association, with an installment of the papers, and numerous notes and notelets.